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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
| 10/606,512 | 06/26/2003 | Jung-Wook Kim | 8054-23 (AW8037US/JJ) | 5217 |
| 22150 7590 03/21/2007 F. CHAU & ASSOCIATES, LLC 130 WOODBURY ROAD WOODBURY, NY 11797 | | | EXAMINER KORNAKOV, MIKHAIL | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1746 | |
| SHORTENED STATUTORY PERIOD OF RESPONSE | | MAIL DATE | DELIVERY MODE | |
| 3 MONTHS | | 03/21/2007 | PAPER | |

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| | | | |
|------------------------------|--------------------------------------|-----------------------------------|--|
| Office Action Summary | Application No. 10/606,512 | Applicant(s) KIM ET AL. | |
| | Examiner Michael Kornakov | Art Unit 1746 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 December 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/14/2006 has been entered.
2. Claims 1-19 are currently pending and examined on the merits.
3. Claims 1, 7, 15 are amended to recite "etching the processing chamber with a plasma of a non-hydrogenous second gas **to remove hydrogen from the processing chamber.**"

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
5. Claims 1-19 are rejected under 35 U.S.C. 112, first paragraph, because the best mode contemplated by the inventor has not been disclosed. Evidence of concealment of the best mode is based upon insufficient evidence of removal hydrogen with the second non-hydrogenous gas. The only place in the specification is page 9, lines 18, 19, which discloses such removal by stating that "Then, a second RF plasma etching

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process is executed with a second gas to remove hydrogen from the processing chamber. At that time, the second gas does not include hydrogen, and the second gas preferably includes an argon gas." According to MPEP, there are two factual inquiries to be made in determining whether a specification satisfies the best mode requirement. First, there must be a subjective determination as to whether at the time the application was filed, the inventor knew of a best mode of practicing the invention. Second, if the inventor had a best mode of practicing the invention in mind **there must be an objective determination as to whether that best mode was disclosed in sufficient detail to allow one skilled in the art to practice it** (Fonar Corp. v. General Electric Co., 107 F.3d 1543, 41 USPQ2d 1801, 1804 (Fed. Cir. 1997). In the instant case the best mode is not disclosed in sufficient detail for the removal of hydrogen using some kind of plasma having argon as a constituent.

5. Applicants recite "a non-hydrogenous second gas". This limitation has been interpreted as any gas mixture, which does not include hydrogen gas in light of Applicants' disclosure stating that "the processing chamber is etched with a plasma of a non-hydrogenous second gas. The only gas that is included in the second gas according to Applicants' specification is Argon. In other words, the non-hydrogenous second gas does not include a hydrogen gas" (paragraph bridging col.7 and 8) and that "a second gas without the hydrogen gas (namely non-hydrogenous) is supplied to the processing chamber" (page 18, lines 9-11).

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6. Amendments to claims 1, 7, 15, 2 and 9 have overcome 35 USC rejections under 112, first and second paragraphs and the rejections are therefore, withdrawn.

7. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

8. Claims 1-4, 7-9, 11, 13-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayasaka et al (U.S. 6,649,082) in view of Roberts et al (U.S. 5,626,775).

Hayasaka teaches a method for manufacturing a semiconductor device comprising treating semiconductor substrate by forming and etching films, including **SiO₂ film**, with a **plasma of gas including hydrogen and argon** (col.5, lines 47-55). Hayasaka also teaches **that the apparatus for forming semiconductor device is cleaned in order to remove unnecessary deposit accumulated on the inner wall of the apparatus**, jig and the like, because unnecessary deposit causes generation of particles and must be removed on occasions so as to form a good film (col.13, lines 2-7). Hayasaka remains silent about the use of non-hydrogenous gas for cleaning the inside surfaces of the apparatus.

Roberts teaches cleaning the walls and other surfaces within the CVD reaction chamber having **silicon dioxide deposits thereon**. The method of Roberts comprises creating plasma etch conditions within the chamber utilizing trifluoroacetic anhydride and a **carrier gas, such as argon**. Roberts specifically indicates the benefits of using trifluoroacetic anhydride as the compound containing no hydrogen, which can act to

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stabilize free radicals initiated by the plasma, and having no significant contribution to Global Warming (Abstract; paragraph, bridging col.2 and 3; col. 4, lines 55-65).

Therefore, since Hayasaka is concerned with cleaning the semiconductor processing apparatus, wherein silicon oxide films have been plasma processed and Roberts teaches cleaning a CVD plasma processing chamber by removing silicon oxide deposits and indicates benefits of utilizing hydrogen free reactive compounds for such cleaning, one skilled in the art motivated by Roberts would have found obvious to exhaust the apparatus of Hayasaka, remove the semiconductor device from the apparatus of Hayasaka, as conventionally accepted in the art, and employ the chamber cleaning method of Roberts by creating a vacuum in the chamber of Hayasaka, introducing trifluoroacetic anhydride and argon and ignite the plasma in order to clean the semiconductor processing apparatus of Hayasaka, thus preventing the apparatus of Hayasaka from forming residual hydrogen radicals. It is also noted that the same apparatus may be used for different semiconductor processing and therefore avoiding the presence of reactive hydrogen radicals upon cleaning would be beneficial for further and different semiconductor processing utilizing the apparatus of Hayasaka.

With regard to claims 8, which is concerned with disposing a belljar, it is noted here that the claimed invention calls for the process claims, wherein the steps of the process are met by the applied prior art, and the structural limitations of apparatus do not present manipulative difference between the claimed process steps and the prior art process. Therefore, the recitation of specific structural limitations of apparatus for

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performing such steps does not serve to limit the claim. See, e.g., In re Otto, 312 F.2d 937, 938, 136 USPQ 458, 459 (CCPA 1963)

With regard to claims 2 and 9, which are concerned with presence of silicon oxide inside the chamber and on certain structural elements, Hayasaka indicates that residues may accumulate on inside surfaces of the processing apparatus during semiconductor device processing. Since Hayasaka indicates treatment SiO_2 containing device, the residues of SiO_2 are expected to accumulate on the inside surfaces of processing apparatus.

With regard to the limitations of claims 13 and 14, which are specifically concerned with exhausting the second gas or the first gas, Hayasaka teaches importance of such exhausting and collecting the harmful gases formed during the semiconductor and/or chamber treatment procedures and Roberts teaches cleaning under reduced pressure, thus continuously exhausting gases from the chamber.

9. Claims 5, 6, 10, 12, 18, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayasaka et al (U.S. 6,649,082) in view of Roberts et al (U.S. 5,626,775) and in further view of Zhao et al (U.S. 5,660,682).

The teaching of Hayasaka/Roberts does not specifically indicate a flow ratio between argon and hydrogen and a temperature for removing impurities, particularly silicon oxide, from the semiconductor device. However, such parameters are result effective, because they affect the rate of processing and surface condition of the substrate. Providing optimum processing parameters is within the skills of ordinary

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skilled in the art and would be obvious, consult *In re Boesch* and *Slaney* 205 USPQ 215 (CCPA 1980).

Besides, the recited processing parameters are conventionally utilized in the art, as specified, for example by Zhao (col.3, lines 32-50), who teaching the use of hydrogen/argon plasma for the removing of silicon oxide from wafer/IC surfaces. Therefore, one skilled in the art would have found obvious to utilize processing parameters of Zhao while treating semiconductor device as per teaching of Hayasaka/Roberts with the reasonable expectation of success.

Response to Arguments

10. Applicant's arguments filed 12/14/2006 have been fully considered but they are not persuasive. It is submitted by Applicants that there is insufficient motivation provided to one skilled in the art to combine Hayasaka and Roberts in the manner set forth in the instant Office Action because at the very least the Roberts reference teaches away from making this combination as proposed. As such Applicants rely on col.4, lines 55-65 of Roberts. In response to this, it is noted that Examiner relies on the same passage of Roberts in providing the motivation to combine the references. In fact what Roberts states is the benefits of using trifluoroacetic anhydride as the compound containing no hydrogen, to clean the chamber to remove the oxide deposits, The use of non-hydrogenous gas to clean the chamber is beneficial in Roberts, because hydrogen can act to stabilize free radicals initiated by the plasma, the presence of which decreases cleanness of the chamber. The other benefit discussed is having no significant

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contribution to Global Warming (Abstract; paragraph, bridging col.2 and 3; col. 4, lines 55-65). It is noted that the chamber cleaning of Roberts involves no hydrogen, exactly the same as in the instant claims.

In response to applicant's arguments against the reference to Roberts individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). It is noted that the reference to Roberts was brought solely for the purpose of showing the chamber cleaning step by the mixture of argon and other gas without the presence of hydrogen, as required by the instant claims.

Applicants further argue that none of the embodiments of Roberts utilize hydrogen as etching material. In response to this it is noted that had Roberts taught the first step (as does Hayasaka) with the use of hydrogen then the reference to Roberts would have been used alone in 102 rejection, while in the instant case it was properly combine with the reference to Hayasaka to show that the chamber cleaning of Roberts, as suggested by Hayasaka is in compliance with the limitations of the instant claims, and that the Hayasaka suggests that the chamber should be cleaned from possible oxide deposits, and Roberts does clean those oxide deposits by the non-hydrogenous plasma.

As for the limitation, reciting "... to remove hydrogen from the processing chamber...", it is noted that since Applicants in the instant specification have only shown Argon as a constituent of the non-hydrogenous plasma, then, the plasma of Roberts

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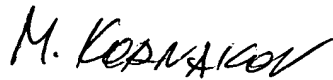
that contains Argon will inherently and necessarily remove hydrogen from the chamber of Hayasaka. One who performs the steps of a process must necessarily produce all of its advantages. Mere recitation of a newly discovered property or function that is inherently possessed by the steps in the prior art does not cause a claim drawn to those steps to distinguish over the prior art. *Leinoff v. Louis Milona & Sons, Inc.* 220 USPQ 845 (CAFC 1984). It is further noted that trifluoroacetic anhydride is known to react with hydrogen species, and as such is fully capable of removing hydrogen from the chamber of Hayasaka.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Kornakov whose telephone number is (571) 272-1303. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on (571) 272-1414. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Michael Kornakov
Primary Examiner
Art Unit 1746

03/16/2007